# Regulation of Sewage Disposal from Houseboats:

## An Assessment of the Problem and Recommendations for the Future

a report

submitted to the

Virginia Department of Health

by the

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## Table of Contents

**Tables**



**Figures**

## General Overview of Federal and Virginia Activities on Sewage Discharges from Houseboats

This report has been prepared for the Virginia Department of Health (VDH) to help evaluate the magnitude of the state's potential problem with moored vessels used for long-term occupancy (hereinafter referred to as houseboats) and the disposal/treatment of their sewage wastes. In September 1988 the Virginia Department of Health (VDH) received a Virginia Coastal Resources Management Program grant from the Council on the Environment (through Federal Coastal Zone Management funding) to determine the magnitude of pollution to Virginia waters from houseboats. Specifically, the objectives of the grant were:

1. To survey Virginia marinas (and "other places where boats are moored," to be referred to as marinas in this report) and houseboat occupants to determine the number of boats being used as houseboats and the potential for overboard discharge of sewage from these vessels;
2. To assess the adequacy of existing state laws and regulations to address the problem of houseboat sewage discharge; and
3. To make recommendations to solve the problem, including new legislation, amendments to existing laws, and new regulations at the state or local level.

Because the question of how to regulate discharges from houseboats grew out of a larger national effort to prevent water pollution and the state's response to related federal mandates, it is instructive to look at events impelling the state to develop specific controls for houseboats.

Virginia has struggled for many years to balance the needs of competing water uses. Recreational and commercial boating and fishing, swimming, using for drinking water supply, and discharging wastewater effluent into receiving waters are frequently incompatible. Since 1967 when the Marine Resources Study Commission reported to the General Assembly that "there is a serious problem resulting from boats at marinas and other places where boats congregate," the state has looked for the best approach to control boat pollution, forestall the condemnation of shellfish growing waters, protect the national certification that allows Virginia shellfish to be marketed in interstate commerce, and enlist cooperation rather than antagonism from the recreational and commercial boaters who regularly use the same waters.

The legislative effort started in 1968 when Virginia lawmakers directed the Virginia Water Control Board (VWCB) to establish a program for controlling sewage discharge from boats and vessels in *all* state waters. In the same session of the General Assembly, the lawmakers directed the VDH to set minimum requirements for marina sewage facilities. By 1969, the VDH had adopted regulations requiring marinas to have a way to pump or otherwise remove sewage from boats.

The following decade brought new initiatives from the federal government to prevent the discharge of untreated or inadequately treated sewage into navigable waters. The U.S. Environmental Protection Agency (EPA) set performance criteria for flow-through marine sanitation devices (MSDs) that would allow boats with installed toilets to discharge treated wastes. These federal standards affected the course of Virginia's efforts to adopt a no-discharge standard for all state waters. In the 1972 amendments to federal water pollution control law, Congress inserted provisions that would allow states to petition EPA for the right to completely prohibit vessel discharges in specified waters. This historic law also laid down a new goal for the nation—to have "fishable/swimmable" waters, a goal that was reemphasized in recent 1987 amendments to the Clean Water Act.

In Virginia "boatable" clashed with "fishable" in that year of 1972. The VDH was forced to condemn approximately 17,000 acres of shellfish growing waters in order to preserve the state's certification under the National Shellfish Sanitation Program, which sets standards for shellfish entering interstate commerce. About 4,500 acres were condemned directly because of boat pollution, and boat pollution contributed to the overall problem in the remaining areas. The VWCB adopted regulations the following year requiring boats with toilets to have sewage retention systems for use in all waters of the state by 1975. By 1975, however, public pressures had persuaded the General Assembly to amend state water control law and prohibit any VWCB regulations more restrictive than federal standards (i.e., from requiring holding tanks in all state waters when EPA allowed flow-through devices as long as they were closed within the three-mile limit). VDH regulations also were criticized, and the legislature ordered a review of marina pumpout rules. In 1975, following the recommendations of an independent study, the VDH made its requirements for onshore toilet facilities less stringent but retained its pumpout and sewage treatment requirements. During that time, many Virginia marinas complained that it was senseless to force them to construct pumpout facilities because there was no demand for them, and some boaters justified the practice of direct discharge because facilities were not readily available.

Meanwhile, national debate continued on the effectiveness of flow-through MSDs and whether the chemicals used in sewage treatment could cause other water quality problems. The EPA and Coast Guard were still in the process of testing and approving acceptable treatment devices, and a great deal of confusion as well as controversy continued over the safety of MSD discharges in sensitive waters, such as shellfish growing areas. The State Board of Health passed a resolution in 1977 recommending the enforcement of regulations requiring holding tanks and pumpout facilities, and the stage was thus set for the necessity of special water quality protection efforts in waters designated as sensitive.

The VDH and the VWCB went to court for enforcement and clarification of their regulations. In 1978 the VDH's regulations were upheld during a series of suits to force compliance by selected marinas. With judicial support of the requirement for pumpout facilities, the VWCB and VDH filed a petition with EPA to certify adequate pumpout facilities in a proposed no-discharge area of the Rappahannock River. More suits were filed against selected marinas. The following year was frustrating, as Virginia's two lead agencies in controlling the effects of boat pollution tried to establish a program that conformed to both state and federal guidelines. By January of 1980 the state asked for judicial help in clarifying the limits of federal law in preempting the VWCB from requiring holding tanks in "no-discharge" areas. Informal EPA opinions at the time held that states could prohibit discharges only in designated areas approved by the federal agency. EPA did not certify the availability of adequate facilities in the proposed zone but deferred taking final action on the state's request. In an ironic twist, the court took note of EPA's action and dismissed the state's suit in September 1980, noting that it was not "ripe for adjudication" since EPA had not ruled on the no-discharge petition and the court's opinion would therefore be merely advisory. Clearly, the state's best attempts to balance water quality protection with water uses were complicated by the need to coordinate these multiple jurisdictional authorities and regulations.

In the years since VDH and VWCB both developed regulations, the state's approach to controlling boat pollution has depended a great deal on developments in the federal mandate to the states. By 1983 the Coast Guard recommended that federal MSD requirements for small vessels be abolished and that states be allowed to have their own programs or to have no program. Eventually, in 1987, federal law was amended to permit states to assume regulatory responsibility for the use of MSDs on houseboats ["a vessel which, for a period of time determined by the State in which the vessel is located, is used primarily as a residence and is not used primarily as a means of transportation"—P.L. 100-4, §311, 101 Stat. 42 (1987)]. States now may adopt and enforce a statute or regulation on the design, manufacture, in-

stallation, or use of any MSD on a houseboat as long as these are more stringent than federal standards.

Currently, Virginia's means of regulating sewage discharge from houseboats include the VDH's regulations governing sanitary facilities associated with boating activities ("Sanitary Regulations for Marinas and Boat Moorings") and the VWCB's regulation to control water pollution from boating activities (Regulation No. 5), which requires that boats in shellfish growing areas have sewage retention devices. All vessels in Virginia and elsewhere in the nation that have installed toilets must be equipped with MSDs. Vessel owners with facilities for sewage discharge are not required to have a Virginia Pollutant Discharge Elimination System (VPDES) permit, although all other dischargers of pollutants into surface waters are.

To respond to the 1987 federal authorization, Virginia's task is to determine the scope of the state's problem specifically with houseboat discharges, define what kind of vessels should be designated for special MSD requirements, and decide if the state will undertake enforcement responsibility. With these decisions, state regulations can be modified to reflect the special controls to be placed on houseboat discharges.

How much of a potential problem is sewage discharge specifically from houseboats in Virginia? The U.S. Coast Guard is the enforcement agency for MSDs, and checks for illegal sewage discharges are made during routine safety inspections. Last year the Coast Guard issued 200 citations for illegal sewage discharges into Virginia waters. Houseboats could be of special concern; because they are moored, houseboats are rarely inspected for their discharges by the Coast Guard. Local building officials and health departments do not exercise jurisdiction over houseboat occupancy, and, according to the VDH, few localities have taken any actions to regulate houseboat sewage disposal at the local level. Further, the places where houseboats are regularly docked often are still, shallow waters that lack adequate flushing. Such waters are particularly sensitive to degradation from sewage inputs.

Recent activities by the Chesapeake Bay Commission may affect Virginia's decisions about the regulation of sewage disposal from houseboats. In a September 1989 meeting, it was suggested that the majority of the estimated 50,000 boats with installed toilets located within Chesapeake Bay waters most likely discharge sewage directly to receiving waters; even those boats with holding tanks may have an illegal by-pass that allows direct discharge. General agreement among Maryland officials, J. Amson (EPA's manager of the National Marine Sanitation Device Program), and results of a Virginia telephone survey of boating dealers indicates that pumpout facilities at marinas are not being used and that many newly manufactured boats with installed toilets are not being equipped with approved MSDs. The Chesapeake Bay Commission recommended in September that a federal inspection program of new boat construction was needed to enforce compliance with current MSD standards. The Commission also adopted a resolution calling for the Bay states to work toward designation of the whole Chesapeake Bay and its tributaries as a no-discharge zone.

## Literature Review: Sewage Discharges from Houseboats

To identify research literature related to houseboats and water quality concerns, a search of seven electronic databases was conducted: Water Resources Abstracts, NTIS, Pollution Abstracts, GPO Monthly Catalog, Biosis Previews, Environmental Bibliography, and Legal Resource Index. Various terms for houseboats (including houseboat, boat houses, liveaboards, pontoon boat, cabin cruiser, yacht, floating home, floating vessel, recreational watercraft, and resident vessel) were combined with such key words as sewage disposal, wastes, marine sanitation devices, treatment facilities, pumpout facilities, environmental

sanitation, and health hazards. The search found only three citations specific to houseboats and wastes (or their related terms) but showed a number of items on recreational vessel discharges. Other materials used in this discussion were provided by agency officials and researchers in other states.

Although there is a dearth of information specifically evaluating the impact of sewage discharges from houseboats, it is clear that the literature reflects an ongoing public debate over the question of public health threats that might be associated with recreational vessel discharges. The concerns range from aesthetically offensive discharges in areas where boats congregate to direct contact with boat sewage during swimming. Also included are the concerns raised by recreational and commercial fisheries that share their territory with marinas and other places where pleasure boats congregate; shellfish harvesting areas can be closed permanently or seasonally because of these conflicting uses. Even the federal requirement to have marine sanitation devices (MSDs) that treat sewage before discharge is raised as a potential problem if the treatment chemicals contribute to water quality degradation. In addition, widespread noncompliance with MSD installation on new boats with toilets and frequent bypassing of holding tanks and shoreside pumpout facilities in favor of direct discharge of untreated wastes are mentioned as problems of enforcement and education.

This larger body of research on discharges from recreational boats raises many concerns about pollution threats but also notes that other sources of degradation (e.g., discharges from municipal sewage treatment plants) account for a much greater proportion of the water quality problem. Nevertheless, the problem is not the volume of wastes from watercraft but the time and place of the discharges that degrade water quality (Seabloom, Plews, and Cox 1989). Subsequently, the regulatory emphasis has been refined to focus on the pollution caused by many boats discharging into small sheltered inlets or marina areas and overwhelming the dilution potential of shallow waters that do not have adequate flushing. The threat of concentrated boat wastes that do not disperse easily may raise both public health questions and the possibility that increased biochemical oxygen demand (BOD) will create "oxygen-poor" bodies of water. Clearly, boats with sleeping, eating, and bathing facilities that are regularly moored in one location and are not used generally for transportation are more likely to be the offending dischargers than transient vessels used for recreation.

Two early studies on houseboat wastes in Oregon reflect a concern for waste quality, quantity, and BOD measurements. Clark's (1967a) study of methods for collecting and treating houseboat wastes notes that the discharge is similar in quantity and quality to domestic waste. The average per capita residential sewage flow reported at the time of this study was 75 gpd, including toilet, kitchen, bath, and laundry wastes for a single-family dwelling. A companion study (Clark 1967b) of houseboat waste characteristics and treatment found that the average per capita $BOD_5$ was 43 $\pm$3 gpd and the average per capita suspended solids count was 34 $\pm$7.1 gpd. Grease and oil in houseboat waste were reported to be higher than in normal domestic sewage and waste.

Oregon has a long history of regulating sewage disposal from floating full-time residences; the state passed legislation in 1965 to prohibit the discharge of sewage from any building or structure, defined to include houseboats. Schmidt (1971) details the technical and regulatory problems faced by the state and the early enforcement efforts when the Oregon Department of Environmental Quality went into court to pursue misdemeanor charges and possible sentences of $1000 or one year in prison, or both. Few convicted violators were fined, and all were given up to 60 days to comply with the law. Many were able to connect to an interceptor sewer in only one weekend.

Another state with considerable experience in houseboat use is California. A staff report for the San Francisco Bay Conservation and Development Commission (1985) distinguishes between houseboats used primarily as residences and liveaboard vessels occupied for extended periods but capable of being used for "active self-propelled navigation." The report notes that liveaboards *generally* have no more impact than other moored boats but houseboat discharges can increase sedimentation rates and change sedimentation patterns in mooring areas. The reduction of wind and wave action in shallow waters stills the water, and thus dredging has become one issue associated with houseboats in California. Government Code §66632(a) includes houseboats and boats moored for extended periods of time as examples of "fill" requiring a permit for placement. In addition to sedimentation, sewage and graywater detrimentally affect water quality by introducing coliform bacteria, soap residues, substances that increase BOD, suspended solids, oil, grease, and biostimulatory substances such as nitrogen and phosphorus. The report also discusses how residential boat uses conflict with other water uses (public recreation, fish and wildlife habitat, and public access). Citing the Commission's authority to protect the public trust and traditional public trust uses of tidelands and submerged lands, such as navigation, fishing, boating, commerce, wildlife, and open space, the report notes that private residential uses are inconsistent with public easement rights and do not serve any "statewide purpose."

In 1986 Washington created a water quality authority to develop a comprehensive plan for water quality protection in the Puget Sound. One element of the plan was the development of a model ordinance (Washington State Department of Social and Health Services 1989b) requiring slipside pumpouts (sewer hookups) or other sewage disposal methods by liveaboards that could be used voluntarily by localities. The model ordinance distinguishes between cruising and noncruising liveaboard vessels. Noncruising types must be connected to the marina sewerage system, which must be connected to an approved local shoreside sewer, or may use a self-contained biological or composting toilet or an incinerating toilet. "Porta-potties" and self-contained recirculating chemical toilets are not allowed by the model ordinance. Cruising liveaboard vessels must be authorized as residences (overnight accommodations for more than four nights within seven days) by the marina supervisor and must not be permanently attached to the dock (these vessels must leave the marina waters at least once every 90 days). Direct discharge toilets and Type I and II MSDs must be physically disconnected. A report accompanying the model ordinance (Washington State Department of Social and Health Services 1989a) summarizes current technology to mitigate the pollution potential from liveaboard vessels. The report notes that major changes to onboard plumbing systems will generally be required and marinas will have to make considerable effort to provide the slipside sewer system.

New Jersey also has made recent efforts to begin regulating watercraft sewage disposal. State legislation in 1988 generally deals with the provision of portside collection devices, but liveaboard vessels are specifically addressed. All marinas allowing liveaboard arrangements may be required by future regulations to provide continuous or regular interval slipside pumpout service in which each slip has access to the pumpout system; the cost of buying and installing these large systems, however, starts at $20,000 (New Jersey Department of Environmental Protection, Division of Coastal Resources 1989a). Because of this expense, the state is proposing to require retrofitting with these systems only if it is documented that overboard discharges are creating water quality problems. Not only does this approach solve the pollution problem, but it also provides an incentive for marina owners to prevent their patrons from overboard discharging (New Jersey Department of Environmental Protection, Division of Coastal Resources 1989b). Exemptions could be granted to marina owners who demonstrated that they do not allow liveaboard vessels.

An article in Zoning and Planning Law Report (1984) summarizes a federal court of appeals ruling that affirmed the right of a New Jersey township to prohibit "floating homes" (defined

as permanent dwelling units and distinguished from "houseboats," which are not designed as residential dwelling units). The court also held that the ordinance was not preempted by federal laws related to ship licenses and water pollution control.

A 1989 case under consideration in Connecticut deals with a contention by floating home owners that floating homes are "vessels," not "structures," and do not require permits for their placement. A brief filed by the state's Department of Environmental Protection (Bolton, Gadzik, and Towbin 1989) points out that the National Electric Code has standards for "floating buildings." Noting that housing is neither a necessary nor an acceptable use of public trust lands and waters, the brief also argues that floating homes do not promote traditional public uses such as navigation, boating, or fishing and actually diminish and compete with legitimate water-dependent uses.

## Trends in Houseboat Use

*Boat Sales*

Boats most likely to be used as houseboats are approximately 30 feet or longer. According to the National Marine Manufacturers Association, twice as many boats in the 30-foot and longer size classes were sold in 1988 as in 1980. The Coast Guard's Office of Boating, Public, and Consumer Affairs has a computerized database of registered motorboats that is another reliable means of tracking trends in boat use over time. National figures of registered motorboats in the 26-foot to 40-foot size class increased approximately 130 percent between 1980 and 1988 (Figure 1). Although boats larger than 40 feet can also be lived on, Coast Guard figures for these are not provided because at sizes greater than 40 feet boats are most likely to also be over five net tons and thus have to be documented; documented boats do not have to be registered. Numbers for categories over 40 feet, therefore, would not accurately reflect the number of registered boats. Numbers of documented boats were not included because many of these are commercial boats and would not be used as houseboats in the sense intended in this report.

Numbers of registered boats for selected states, including Virginia, for the years 1980-1986 are shown in Figure 2. In Virginia, there has not been a steady increase in the number of boats. Numbers of registered motorboats in the 26-foot to 40-foot size class in Virginia for 1987 and 1988 were 5,389 and 5,503. The number of registered boats in this size class ranged from a low of 5,043 in 1984 to a high of 6,600 in 1982. (The high number in 1982 is probably the result of lowered gasoline prices after rather high prices in 1980 and 1981, according to Nancy Jamerson at the Titling Office of the Department of Game and Inland Fisheries in Richmond.) This sudden increase in 1982 was seen also in the total number of registered boats for the entire country (Figure 1). Although there was a fairly steady increase in the number of boats registered in Virginia between 1984 and 1988, the number of boats registered in 1988, 5,503, is only about 9 percent higher than that in 1984. Note that five of the seven states in Figure 2 also show increasing numbers of boats since 1984.

Figure 2 also shows the numbers of registered motorboats in the 26-foot to 40-foot size class for Middle Atlantic and southeastern states that expressed concern about houseboats in the Water Center's state survey. Most of these states have shown generally increasing numbers of boats in the size class of interest.

Of the states surveyed concerning houseboat sewage regulation, six were "no-discharge" states. In spite of these stringent regulations, four of these states (Michigan, Ohio, Illinois, and Wisconsin) have shown a steady increase in boat registrations since 1983. Michigan has

the greatest number of registered boats in this size class and also the greatest rate of increase since 1983.

It is apparent that in spite of increasingly stringent environmental requirements, the number of boats sold in this size class will continue to increase. Virginia, with its increasing coastal growth (which will probably lead to increased land and house prices and taxes) and relatively mild climate, will no doubt see an increase in the number of boat owners using their boats as residences for at least part of the year.

*Effect of Real Estate Availability and Cost on Houseboat Use*

A number of state and local officials interviewed attributed the popularity of houseboats to the price and availability of waterfront real estate and the lack of real estate taxes for houseboats. Prince William County waterfront property, which is already 80 percent developed, was estimated at $300,000 an acre, and even a townhouse costs approximately $100,000. A local official in Hopewell indicated that escaping real estate taxes was a big incentive for living on a houseboat. In Pulaski County, although only approximately 25 percent of Claytor Lake's shoreline is developed, much of it will not be developed because of steep slopes unsuitable for building. In this case, lack of available waterfront real estate more than exorbitant price may result in increased use of houseboats.

Outside Virginia, several state officials agreed that property prices and real estate taxes provide incentive for people to use houseboats as permanent residences or second homes. In New Hampshire, houseboats are used primarily as vacation homes, with people living on them all summer or for weekends and vacation weeks during the summer. As the New Hampshire contact pointed out, if people want to use lakes for recreation and they build a cottage or summer home, they still have to buy a boat to get out on the water. If they buy just the boat, they can use it for both recreation and a dwelling at a fraction of the cost. Property around New Hampshire's major lake sells for $2,000 a waterfront foot, not an insignificant cost. Texas, likewise, indicated that houseboats allow people to enjoy water recreational activities for less cost than building near or on the waterfront. In Washington, D.C., houseboats are more likely to be used as permanent residences for financial reasons unrelated to recreation. Property taxes of $2,000 can be avoided by living on a houseboat, and although houseboats are not inexpensive they are certainly cheaper than some of the cheapest housing in the District. Some houseboats at marinas near Washington's fishing wharves are even used as boarding houses, with fish market workers from nearby islands bunking in a boat five nights a week and returning home for the weekend. As in Prince William County, Washington also has its share of "floating homes"—houses that could be built on land but are floated on pontoons at a marina instead. In Maryland, the concern that local government tax bases were being eroded by increased use of houseboats as permanent residences led to strong local support for stringent state regulations.

*Influence of Potential Land Use Regulations on Houseboat Use*

Only one of the Virginia localities contacted specifically mentioned restrictions on developing waterfront property as an incentive for houseboat use. In Prince William County, a failed perk test prevented someone from building on waterfront property. The person's response was to build a two-story wood-frame townhouse and float it on the water at a marina. This provides one illustration of the use of "houseboats" to get around building restrictions on land. As concern about nutrient and pollutant influx into Virginia's waters increases, more stringent land use regulations for shorefront property may have a similar effect. In Bath County, the entire Lake Moomaw watershed is designated a "conservation area," and the minimum lot size for houses is four acres. While this kind of planning will probably do much

to protect water quality, it may also serve to increase houseboat use as the area becomes more popular for recreation.

It is possible that public access to recreational waters also affects houseboat popularity. If access to a lake or reservoir is limited because it is all privately owned or developed, there may be more incentive to live on a houseboat just so that it is more convenient to get to the water to swim, picnic, sun, water ski, and fish. The availability of public picnic grounds, swimming areas, campgrounds, moderately priced motels, and small watercraft launches may make it less desirable to invest in a houseboat for occasional recreational use.

## Houseboat Residency Study

*Development of the Study*

As mentioned earlier in this report, in September 1988 the Virginia Department of Health (VDH) received a Virginia Coastal Resources Management Program grant from the Council on the Environment (through Federal Coastal Zone Management funding) to determine the magnitude of pollution to Virginia waters from houseboats. In this section, the results of the first objective of the VDH houseboat study are presented: to survey Virginia marinas (and "other places where boats are moored," to be referred to as marinas in this report) and houseboat occupants to determine the number of boats being used as houseboats and the potential for overboard discharge of sewage from these vessels. Before this study was done, information about houseboats in Virginia was unavailable. The numbers of houseboats in use in the state were not known; neither were any data available that might provide some indication of how many boats in use as houseboats are discharging sewage to Virginia waters.

Two survey instruments were designed by a VDH Houseboat Study Committee to address these questions. One survey was developed to gather information about the numbers of boats that might be used as houseboats at Virginia marinas. This "houseboat survey" included items to determine the number of boats used as primary residences, the numbers of people occupying boats, and connections for water, sewer, and electrical power. The survey also categorized boats by size classes and the amount of time people spend living on board. VDH sanitarians completed houseboat survey forms for each of the 922 marinas in the state.

The second survey was designed to collect data from houseboat occupants themselves. It included questions about the use of marine sanitation devices (MSDs); food preparation, shower, and toilet facilities; the number of berths on board and the number of persons living aboard; and other questions aimed at determining the amounts of wastewater generated and methods for disposal. VDH sanitarians surveyed houseboat residents in person.

*Results of the Study: Houseboat Survey*

According to VDH information, Virginia has a total of 922 marinas in 51 counties and independent cities (Figure 3). Of these 922, usable data relating to houseboat use (or potential houseboat use) were collected by VDH sanitarians for 108 marinas. These 108 marinas are located in 16 of the total 51 counties and independent cities with marinas, and all but Bedford are in the Chesapeake Bay watershed. The cities and counties with useful survey data are Accomack, Alexandria, Bedford, Chesterfield, Fairfax, Gloucester, Hampton, Henrico, Lancaster, Mathews, Middlesex, Norfolk, Northumberland, Prince William, Suffolk, and Virginia Beach. Data summarized in the following paragraphs are from these 16 localities.

A variety of indicators can be used to estimate the total number of vessels in use as houseboats in Virginia. Some of the houseboat survey questions provided direct evidence of the use of vessels as houseboats. For example, a total of 116 boats were reported to be used as primary residences. Nearly 700 boats are connected to onshore water supplies, suggesting use of water (and generation of wastewater) while moored. Almost 1,800 are connected to electric power, and, of these, 628 boats have separate electric meters. Approximately 43 percent of the slips in the 108 surveyed marinas are occupied by boats that have sleeping, food preparation, and toilet facilities: a total of 3,623 boats are so equipped. Only half the boats at surveyed marinas were reported to be out of their slips at least once per month, indicating either that these boats get little use for transportation or recreational purposes or that they are used as stationary residences.

Another indication that a boat may be used as a houseboat is the length of time it is occupied. At the 108 marinas surveyed, 796 boats are reported to be occupied for 31 to 90 days, 15 for 91 to 180 days, and 94 for more than 180 days. A total of 905 boats are occupied for longer than 30 days.

The data collected through the VDH houseboat survey show that vessels potentially used as houseboats are found most frequently in six localities (Table 1). If sewage discharge from houseboats is a problem in Virginia, then these areas might be expected to show the effects of such pollution. The use of three indices of potential houseboat concentrations (see Table 1 footnotes for explanation) suggest that Fairfax, Gloucester, Lancaster, Middlesex, Norfolk, and Virginia Beach are localities that might have numbers of houseboats high enough to result in sewage discharge problems. Some of the variables that indicate a vessel may be in use as a houseboat (number of days of occupation, use as primary residence, and connections to water, electric, and sewer) are presented for these six localities in Table 2.

The above summaries provide some information about the potential numbers of houseboats in use in Virginia. Whether those houseboats are discharging sewage to state waters is another question. Nearly all the marinas surveyed (93 percent) had onshore toilet facilities. However, close to half of the surveyed marinas (42 percent) had no pumpout facilities for the disposal of sewage from boat holding tanks. Marinas with no pumpout facilities are located in Accomack, Alexandria, Chesterfield, Gloucester, Hampton, Lancaster, Mathews, Middlesex, Norfolk, Northumberland, and Virginia Beach; five of those are localities identified as having significant numbers of potential houseboats (Table 2). In Virginia Beach, 11 of 16 marinas have no pumpout facilities, and in Norfolk, 14 of 24 marinas have no pumpout facilities. Approximately 18 percent of boats with cooking, sleeping, and toilet facilities are located at marinas with no pumpout facilities.

*Results of the Study: Interviews with Houseboat Occupants*

Interviews with houseboat occupants were conducted by VDH sanitarians during the work day. Unfortunately, very few people thought to be living on houseboats were at home; sanitarians suggested that most people living on houseboats also work and were simply unavailable for questioning during the day. Indeed, data from the houseboat survey indicated that 80 percent of the occupants of houseboats at surveyed marinas were employed.

The number of completed interviews, therefore, is small, and data collected may not provide a representative picture of Virginia houseboat occupants. Nevertheless, the information gained by interviewing these houseboat occupants helps to fill in some details not provided by the survey of marinas. A total of 17 occupancy surveys were completed. Houseboat occupant interviews were completed in the counties or independent cities of Gloucester (three interviews), Middlesex (three), Norfolk (six), Northumberland (one), Prince William (one), Suffolk (one), and Virginia Beach (two).

Sixteen of the seventeen respondents had spent the previous night on board their boats, and the average number of people spending the night per boat was 1.8 (minimum = 1; maximum = 4). The boats on which respondents live average 44 feet in length and have an average of four berths. About three-quarters of those surveyed use their boat as their primary residence, and they spend almost every night during the year on their boats. One quarter of those interviewed spend between 180 and 265 nights on their boats. Most of those interviewed were employed (82 percent). Approximately a third of the boats are moved out of their moorings less than once a month, and none of the respondents use the boat to travel to a place of employment.

All of the respondents' boats had food preparation equipment and 82 percent had showers; 82 percent also had installed toilets. Of those boats with installed toilets, half of them did not have any MSD. For the half with MSDs, equal numbers had Type I and Type II and a slightly higher number had Type III. Five of the respondents had portable toilets that were emptied at an onshore bathroom or onshore dump station. In response to a separate question, ten boats were reported to have sewage holding tanks. Of these, pumpout frequency included twice a week (one boat), once a week (two), twice a month (one), once a month (one), three or four times a year (one), two or three times a year (two), and once a year (two).

*Results of the Study: Additional Comments*

It is instructive to examine the locations of Virginia marinas (Figure 3) in reference to the Virginia localities survey conducted by the Water Center (see "Local Concerns and Approaches") on existing and proposed houseboat regulations. Prince William County is the only county identified by the houseboat survey as potentially having houseboats that also enforces some type of restrictions on houseboats. Pulaski County and Hopewell indicated that some local restrictions apply to houseboats, and several other localities (Cape Charles, Rocky Mount, Prince George County, Bath County, Central Shenandoah Planning District Commission, Chesapeake, and Bedford County) indicated the issue of houseboats has at least been discussed. Several of these localities with plans for regulating houseboats or with discussions underway do not currently have houseboats or marinas but indicated that problems elsewhere in the state motivated local concern.

The results of the houseboat occupancy interviews support results from an earlier telephone survey conducted by the VDH and observations made by J. Amson of the EPA that boats with installed toilets are not being equipped with MSDs. Half of the boats in the houseboat occupancy survey with installed toilets did not have MSDs. According to the VDH's telephone survey, 20 percent of the 1,089 boats sold in Virginia in 1988 with installed toilets did not have MSDs. Such information could be used to justify the Chesapeake Bay Commission's recommendation that a federal inspection program of new boat construction is needed to enforce compliance with current MSD standards.

## State Concerns and Approaches

*Concerns*

There is little hard evidence to indicate that houseboat sewage is a major cause of water pollution. A telephone survey of 21 states conducted by the Water Center did not turn up information about any systematic studies of problems caused by houseboat sewage disposal; however, a number of state contacts indicated that water quality concerns had

prompted development of state regulations. A few states are currently working on studies. For example, Connecticut's Department of Environmental Protection is collecting water quality data for certain harbors where it is suspected that sewage disposal is a problem. In the District of Columbia, negotiations are underway with the Occoquan Laboratory to conduct a study determining the amounts of sewage generated by residential boats.

Other "evidence" of water quality and public health problems takes the form of anecdotes from various state contacts. Maryland's floating home regulations were developed in response to water quality concerns, and New Hampshire's no-discharge policy was prompted by nutrient and esthetics problems related to sewage disposal on freshwater lakes. Michigan began looking at boat sewage disposal problems about 30 years ago and found that fecal coliform levels in marinas were higher than elsewhere and that "slugs" of coliform-contaminated water were coming out from marina basins. New Jersey has had problems with shellfish beds being closed or declared to be seasonal, and the state felt that boat sewage was one of a variety of pollutant sources. The District of Columbia is concened about the proliferation of floating houses and their potential for pollution and also is concerned about what happens to boat sewage when the District's mobile pumpout station is iced in.

The main concern in Virginia is the effect of boat sewage that finds its way to the Chesapeake Bay, either through direct discharge into the Bay or discharge into the rivers and streams that feed it. The results of the Virginia Department of Health's houseboat survey (see "Houseboat Residency Study") indicate that there is some cause for concern about houseboat sewage, at least in the Chesapeake Bay watershed. Six of the localities that were identified as having significant numbers of potential houseboats (all within the Chesapeake Bay watershed) had one or more marinas lacking pumpout facilities for the disposal of sewage. In two Bay localities, the majority of surveyed marinas did not have pumpouts.

Interviews with 17 houseboat occupants conducted by VDH personnel indicated that half the respondents' boats with installed toilets had no marine sanitation devices (MSDs). Although this may not be representative of all boats in use as houseboats in Virginia, a VDH telephone survey of boat dealers suggested that 20 percent of boats sold with installed toilets have no MSD. Further, J. Amson of the EPA has suggested that most of the estimated 50,000 boats in the Bay that have installed toilets directly discharge their wastes into the water even if they have holding tanks, supporting the conclusion that these boats are a source of sewage pollution. Virginia localities, while not expressing concern about current problems with houseboat sewage (see "Local Concerns and Approaches") worry that there may be problems in the future and want to be prepared.

*States' Approaches to Regulating Houseboat Sanitation*

Data on statutes and regulations concerning houseboat sewage in other states were obtained in three ways. First, an electronic search of state statutes, using WESTLAW, a service of West Publishing Company, was conducted by the Water Center. Searches were conducted using a combination of two sets of terms: (a) houseboat, house boat, resident vessel, liveaboard, or floating home and (b) sewage, sanitation, toilet, waste, or marine sanitation device. Second, statutes of states not included in WESTLAW databases, but felt to be of interest because of the presence of sizeable bodies of water in the state, were searched manually in the Washington and Lee University Law Library. Third, telephone contacts in 21 states were asked about state statutes and regulations.

*Definition of Houseboats*: How a houseboat is defined is critical to its regulation, and states have developed a variety of means of defining and naming houseboats. In state statutes, the most commonly used names for this type of vessel are houseboat, liveaboard vessel, resi-

dent vessel, and floating home. In the following discussion, houseboat will be used as the general term for the kind of vessel meant by these names.

No matter what name is given to these vessels, the means of identifying them and thus opening them to regulation fall into four basic categories:

1. Making it clear in statutes that houseboats are vessels, boats, or watercraft;
2. Defining a houseboat in terms of residency time or some residential structural aspect of the vessel;
3. Including floating structures that are used for commercial purposes under the heading of houseboat; and
4. Including any structure that floats and is moored, but that is not used as transportation, under the heading of houseboat.

States use these categories either singly or in combination.

Typical wording of the first kind of statute is found in Missouri's Code: "***Boats, any vessel or watercraft*** moved by oars, paddles, sails, or other power mechanism, inboard or outboard, or any other vessel or structure floating upon the water whether or not capable of self-locomotion, ***including, but not limited to houseboats***, barges and similar floating objects;. . ."

An example of the second category is found in Delaware's draft marina regulations: "Resident Vessel. ***A vessel occupied by people*** and docked or moored at an anchorage, marina or other boat docking facility ***for a period exceeding a total of two weeks in a single year.***" Another example from this category, but using the structural aspect as the identifying feature, can be found in New Hampshire's statutes: "Houseboat means any ship, boat, raft, float, catamaran or marine craft of any description upon or within which are located ***sleeping and toilet facilities***, regardless of whether such facilities are of a permanent or temporary nature."

Typical wording of the third category is found in the definition of liveaboard vessel given in Delaware's Code: "Live-aboard vessel shall mean: a) A vessel used principally as a residence; b) ***A vessel used as a place of business, professional or other commercial enterprise*** . . . ; or c) any other floating structure used for the purposes stated under paragraph a. or b. of this subdivision."

Maryland regulations contain a definition that combines the third and fourth categories: "Floating home means any vessel, whether self-propelled or not, which is: (a) Used, designated, or occupied as a permanent dwelling unit, ***place of business***, or for any private or social club, including a structure constructed upon a barge ***primarily immobile and out of navigation or any structure which functions substantially as a land structure*** while the same is moored or docked within Maryland; . . ."

Once a state has defined what a houseboat is, it has a variety of means at its disposal for regulation of sewage.

*State Statutes, Regulations, and Policies for Control of Houseboat Sanitation*: In some states, regulation of houseboat sewage occurs entirely through federal MSD regulations. Other states regulate non-navigable waters through state-level agencies or give regulatory powers to localities, with only oversight occurring at the state-agency level. In "no-discharge" states, specific houseboat rules are really not necessary, although rules for floating residences (which have no means of self-propulsion and thus may escape regulations applying

to watercraft) may be. Localities use a variety of means to regulate houseboats (see "Local Concerns and Approaches")

Regulation by state level agencies may take a number of forms:

1. A state may declare statutorily that a houseboat is a vessel or watercraft and subject to vessel or watercraft regulations;

2. A state may have special statutes or regulations for regulating houseboat sewage; or

3. A state may regulate houseboat sewage only on certain waters.

It should also be noted that some state contacts indicated that the state does regulate houseboats in practice, but not by statute or promulgated regulation.

Massachusetts is an example of a state that puts houseboats in the same category as other watercraft for regulation of sewage discharge. Under Massachusetts General Laws, the Division of Water Pollution Control is directed, given certain restrictions, to "adopt, amend, or repeal . . . regulations to control or prevent the discharge of sewage, garbage or other waste material from watercraft of any type, including houseboats."

Although Ohio does not specifically call houseboats watercraft, their statutes do specifically prohibit the discharging from watercraft into water the kinds of wastes that houseboat dwellers would generate: "kitchen wastes, laundry wastes, slop sink drainage, or other household wastes." The Ohio contact stated that this statute applies to houseboats; even though the statute does not state that houseboats are considered watercraft, the practice is to treat them as watercraft.

The second category, special statutes or regulations for houseboat sewage, can be found in Maryland and Delaware. Delaware's draft marina regulations propose that each resident vessel (see above for definition) in a slip be provided with a slipside pumpout facility and that resident vessels be required to use these facilities. According to the Maryland contact, Maryland regulates floating homes as it would any residence. Floating homes (see above for definition) must have permanent hookups to an onshore septic system or sewer line.

Texas, in addition to stating that houseboats are included under the heading of boats, is included in the third category. It requires houseboats operating on certain bodies of water to be equipped with an approved non-flow-through marine sanitation device.

How well do these approaches work? Of the seven states that answered questions concerning the effectiveness of their enforcement of the statutes and regulations, only two, Michigan and New Hampshire, reported rather strict penalties. Wisconsin appears to have an enforcement program in place. The other states appear to have minimal enforcement: the District of Columbia reported that enforcement of their no-discharge law was very difficult, Maryland has no set program for enforcement, and contacts in Ohio and Texas could not remember anyone ever having been cited for a violation.

*Virginia's Laws and Regulations*: Virginia currently regulates boat sewage through the VWCB's "Regulation No. 5," which requires that boats in shellfish growing areas have sewage retention devices, and the VDH's "Sanitary Regulations for Marinas and Boat Moorings." VDH's regulations require all marinas and boat moorings to provide onshore toilet facilities, sewage dump stations, and boat sewage holding tank pumpout facilities for the use of boaters. A boat is defined by the VDH regulations to include vessels or structures "floating on water in the Commonwealth of Virginia, whether or not capable of

self-locomotion" and specifically states that houseboats are included. The VDH regulations do not require, however, that boaters use these facilities.

*Future Approaches*: One of the newer approaches to handling the problem of houseboat sewage is to regulate houseboats, especially the floating home variety, as structures rather than as vessels. This approach could be used in Virginia, as it appears that nothing in the Uniform Statewide Building Code requires that buildings and structures be on land. In addition, § 10 of the Rivers and Harbors Act of 1899 prohibits construction of certain structures in or affecting navigable waters without obtaining a Corps of Engineers permit. The regulation that defines "structure" [33 CFR § 322. 2(b)] includes any "permanently moored floating vessel," and a 1983 case ruled that houseboats only become structures requiring §10 permits if they are permanently moored [United States v. Boyden, 696 F.2d 685 (9th Cir. 19830]. The San Francisco Corps office has developed criteria for determining when a vessel is permanently moored and needs a §10 permit, including duration of mooring, how it is attached to the mooring, type of utility hookups (temporary or heavy-duty, permanent or semi-permanent), type of grounding, whether its use is typical of structures on shore (such as full-time residences), and whether it lacks self-propulsion.

In Connecticut, attempts have been made to pass legislation requiring no-discharge for liveaboards. So far the legislation has not passed, but it appears that it may pass in the future.

## Local Concerns and Approaches

To determine whether Virginia localities regulate or are planning to regulate houseboat sewage disposal, the Water Center sent a letter to 91 planning district executive directors, city and county planning directors, and other officials in counties and towns that border large bodies of water (lakes and reservoirs, coastal areas, and large rivers). The letter explained the purpose of the survey and asked whether the area had a means of regulating houseboats and for a contact person for more information. A total of 75 replies were received. Of those, only eight localities indicated that they have or are considering regulations. However, 51 of the respondents sent names and telephone numbers of contacts, despite indicating that they had no means of regulating houseboat sewage disposal. Contacts for six of the localities which indicated that they are or are thinking about regulating houseboats were interviewed by Water Center personnel via telephone.

The concerns and approaches of localities in other states were determined through telephone interviews with contacts in various states. The information provided about problems related to houseboat sewage disposal was anecdotal; in some cases, copies of local ordinances and regulations were obtained.

The information gained from localities in Virginia and in other states shows that localities can approach regulation of houseboat sewage disposal in a variety of ways. One alternative skirts the issue of sewage disposal but effectively controls it by prohibiting the use of houseboats altogether. Such an approach is based on the idea that marinas are a use of land and therefore can be regulated using available land-use planning and zoning ordinances. Approaches vary from total prohibition to a limit on the number or percentage of slips at a marina that can be used by houseboats. The other most common alternative seems to be to allow the use of houseboats but to approach them as structures or residences rather than as watercraft and to use existing requirements for sewer, water, and electrical permits to control sewage disposal,

*Virginia Localities*

The six Virginia locality contacts interviewed were asked a series of questions about houseboat use, problems caused by houseboat sewage disposal, and means of regulating sewage disposal from houseboats. Although all six had responded affirmatively to the original query about having a means of regulating houseboat sewage disposal, telephone interviews revealed that only three of the respondents actually do have local regulations, and one of those currently has no marinas or houseboats to regulate.

The responses to questions about water quality and public health concerns were instructive. Of the six localities contacted, none said they had any water quality or public health problems caused by houseboat sewage disposal, and two (Bath County and the Central Shenandoah Planning District Commission) do not even have marinas on the major lake in their area, Lake Moomaw. Nevertheless, they are concerned about the possibilities of problems in the future and want to plan ahead to be sure that houseboat sewage disposal is something they will be able to regulate before it becomes a problem. Likewise, the localities that responded affirmatively to the "means of regulating" question also indicated concern about public health and water quality problems, although they had no evidence of any specific problems. The Hopewell contact mentioned that pollution from Allied Chemical overshadows any problems that might be caused by boat sewage disposal. Although all six localities responded negatively to a question that asked specifically about disposal problems affecting the use of water for a public drinking water supply, for swimming, for sport or commercial fishing, and other uses, they also indicated that the lack of current problems did not make them believe there would be no future problems. As the Prince William County contact said, "Dumping raw sewage is not a desirable thing; just because no one has gotten sick yet doesn't mean it won't happen in the future."

The approaches of Virginia localities to regulation of houseboat sewage disposal vary:

*Special use permit:* In Pulaski County, a new zoning ordinance requires a special use permit to moor or dock a houseboat. Obtaining the permit requires giving notice to adjacent property owners, a public hearing, and planning commission approval.

*Conditional zoning:* Rather than try to regulate sewage disposal from houseboats in Prince William County, they are simply prohibited at all new marinas. Conditional zoning provisions allow the health department to lobby the planning office to impose a condition prohibiting houseboats when new marinas are planned. The General Assembly granted Prince William County and other northern Virginian counties the authority to use conditional zoning primarily to help control development in the area, and a side benefit was that it allows prohibition of houseboats.

*Houseboats as structures:* In Bath County, although there currently is not a problem with houseboat sewage disposal (Lake Moomaw does not yet have a marina), the contact is confident that existing zoning ordinances and the statewide building codes will allow them to regulate houseboats as structures and single-family or multi-family dwellings. As such, all permit requirements for water, sewer, and electrical connections would apply to houseboats in the same way that they apply to on-land dwellings.

*Other Localities*

Several states, including Connecticut, Maryland, New Jersey, and Wisconsin, reported that some localities simply prohibit houseboats. In Madison, Wisconsin, the prohibition applies to habitation on boats overnight, which the Wisconsin Department of Natural Resources contact seemed to think would probably not stand up in court.

An ordinance used in Wrightsville Beach, North Carolina, requires the connection of houseboats to public sewers. No overboard discharge is allowed, and floating homes are permitted only in commercial marinas.

A city ordinance in New Jersey (North Wildwood in Cape May County) differentiates between houseboats that have no means of propelling themselves and other watercraft used as residences. The houseboats with no means of moving are prohibited outright, and other watercraft used for living quarters are restricted to 38 percent of the space at a marina.

New Hampshire, a state that does not have statewide requirements for pumpout facilities at marinas, does encourage localities to adopt a model zoning ordinance that requires marinas to install both pumpout facilities and comfort stations.

In Connecticut, a state statute gives localities the authority to prevent the anchorage of houseboats near beaches, boathouses, or residences if five citizens that live adjacent to the facility in question apply to do so.

Texas localities may issue their own regulations for controlling boat discharges as long as the regulations are at least as strict as state regulations. Houston requires boats to have city decals, and some localities have taken over the job of certifying boat MSDs. A boat owner with proof of local certification can receive state certification to operate on Texas's specially designated lakes by paying an additional $2 fee.

In the state of Washington, the Department of Social and Health Services has recently issued a model ordinance for liveaboards and a report that describes technical solutions to houseboat sewage disposal problems. The model ordinance requires slipside sewage collection, transportation, treatment, and disposal facilities for houseboats at both private and public marinas.

## Recommendations

*Houseboat Definition*

*Introduction*: There are two kinds of "houseboats" that are a cause for concern to state and local governments. One is a boat that people live on for some extended period of time and that is capable of self-propulsion. The other is a floating home that is usually incapable of self-propulsion and rarely moves from its moorings. Floating homes, as well as lived-on boats, should be of concern to the Commonwealth. Contacts in the District of Columbia, New Hampshire, Texas, and Prince William County, Virginia, noted that people use both floating homes and lived-on boats as a means of avoiding high taxes and property or house prices. Floating homes can be quite large, conventional one- to three-story houses, according to contacts in the District of Columbia and Prince William County, and in several states are regulated differently from lived-on boats. Depending on the potential for sewage discharge from floating residences in Virginia, the state should consider having either two definitions that distinguish between lived-on boats and floating homes or a definition that includes both, as in the definition below.

*Definition*: **floating residence** — any ship, boat, catamaran, barge, platform, or marine craft of any description, or any building or structure (as defined in § 36-97 of the Uniform Statewide Building Code), regardless of motive power, in or on bodies of water in the Commonwealth of Virginia, upon or within which are located sleeping and toilet facilities, regardless

of whether such facilities are of a permanent or temporary nature, and which is used as a habitation for more than 30 consecutive days.

The following definition should be included or referenced in any section of the Virginia Code which defines floating residences:

> **habitation** — a place of residence, either permanent or temporary.

*Comment:* The word houseboat has been replaced with the word "floating residence" because it is more descriptive and avoids conjuring up stereotypical images of houseboats as small, cheap dwellings on floats. The definition is based on a New Hampshire law (N.H. Rev. Stat. Ann. §270-A:1-270-A:7, 1987 & Supp. 1988).

These partial definitions have been added so that the reader does not have to refer to the Code:

> **building** — ". . . a combination of any materials, whether portable or fixed, having a roof to form a structure for the use or occupancy by persons, or property, . . ." [Va. Code Ann. §36-97 (Supp. 1989)].
>
> **structure** — ". . . an assembly of materials forming a construction for occupancy or use. . ." [Va. Code Ann. §36-97 (Supp. 1989)].

*Recommendations for Actions at the State Level*

In 1987 federal law was amended to permit states to assume regulatory responsibility for the use of MSDs on houseboats ["a vessel which, for a period of time determined by the State in which the vessel is located, is used primarily as a residence and is not used primarily as a means of transportation"—P.L. 100-4, §311, 101 Stat. 42 (1987)]. States may adopt or enforce a statute or regulation on the design, manufacture, installation, or use of any MSD on a houseboat as long as these are more stringent than federal standards. The following recommendations present a number of issues for Virginia to consider in the development of a state program for controlling houseboat wastes.

1. **The state should adopt a definition of houseboats and regulate MSDs aboard them pursuant to § 311 of the Clean Water Act, but first the state needs to determine whether it needs different regulatory controls for movable and nonmovable houseboats based on the types of houseboats used in the state.**

   *Comments*: Several states have decided to make regulatory distinctions between movable houseboats that are used for short-term habitation and houseboats that rarely move and are used as permanent residences. A model ordinance developed by Washington differentiates between cruising and noncruising liveaboard vessels and has stricter regulations for the noncruising vessels. California calls a residential vessel that is not used for active navigation a "houseboat" and calls a boat that is used for navigation but also is moored for an extended period of time a "live-aboard boat." Regulations under consideration in New Jersey would apply special requirements at new marinas servicing "live-aboard vessels," which are defined to include only vessels used principally as residences for more than seven consecutive days and used for transportation only as a secondary or subsidiary use. There is a recommendation included below in *Future Research and Study* that suggests the state should make a new study of houseboat occupants in order to determine how much of a problem these two types of floating residences are in Virginia.

2. **The VWCB and VDH should designate that wastewater discharges not be allowed in inland waters and coastal waters of the Chesapeake Bay.**

   *Comment:* The state's long efforts to get a no-discharge petition approved by the EPA are stymied and may have to begin again at the stage of surveying marinas for pumpout facility capacity in the proposed no-discharge area. The EPA has indicated to the VDH that the ten-year-old petition information may no longer be up-to-date. An effort to update that petition may be superceded, however, by the state's participation in the 1987 Chesapeake Bay Agreement to work toward eliminating pollutant discharges from recreational boats in the Bay area. The Chesapeake Bay Commission noted in a resolution dated September 8, 1989, that designation of the entire Chesapeake Bay and its tributaries as a no-discharge zone would ultimately be the way to achieve this objective of the Bay agreement. Regardless of the petition's status, state officials need to catalog where existing pumpout facilities are located and where their ultimate point of disposal is, determine whether greater treatment capacity is needed to accommodate the treatment of boat sewage, and identify which localities lack adequate facilities. The state should target identified localities to receive state support for construction loans. This recommendation places the effort to assume state control over MSDs on floating residences in the context of the VDH's larger effort to follow state and federal guidelines for marine pollution control.

3. **The state should consider a total ban on floating residences in very sensitive areas.**

   *Comment:* Policing MSD discharges in sensitive areas will be difficult and probably inadequate if funding is limited. In areas where protecting water quality is a very high priority and the waters are especially sensitive to boat wastes because of such characteristics as poor flushing or high nutrient loadings from other pollution sources, an outright ban on floating residences may be the most efficient method of control in terms of time and costs. In addition to state designation of areas where floating residences may not moor, the state can effectively do the same thing by granting authority for conditional zoning to selected localities. Prince William County is an example where conditional zoning procedures are currently used to prohibit liveaboards at new marinas.

4. **The state should require that floating residences meet state building code requirements for hookups to water, sewer, and electrical utilities, regulate floating residences as structures rather than as vessels, and allow localities to tax such structures as if they were improvements on real estate.**

   *Comment:* It appears that nothing in Virginia's Uniform Statewide Building Code requires that buildings and structures be on land.

5. **The VDH should require all marinas that provide docking services for floating residences to provide dockside services for wastewater and sewage disposal along with other utilities.**

   *Comment:* Provision of adequate sewage disposal facilities may decrease overboard dumping as well as facilitate designation of sensitive areas as no-discharge zones. It is not practical, however, to use pumpout facilities if houseboats that rarely move from their moorings have to travel to use them, and thus dockside connections for utilities should be required in order to discourage noncompliance with pumpout requirements.

6. **The VDH should amend its regulations to establish the maximum fee that a marina can charge boaters for using pumpout facilities constructed with public funds.**

*Comment:* The cost and the inconvenience associated with using pumpout facilities are thought to be important deterrents to obtaining greater voluntary cooperation from the boating public.

7. **The VDH and the VWCB may find it useful to coordinate pollution control efforts related to MSDs on floating residences, as they do in other sewage sanitation matters. For instance, depending on other elements in the state's approach to assuming control of MSDs aboard houseboats, the VWCB may choose to require VPDES permits for any floating residences with Type I or II MSDs as point source discharges.**

   *Comment:* The VWCB issues VPDES permits in Virginia but excludes discharges of sewage from vessels from the list of pollutants requiring discharge permits, just as the national Clean Water Act excludes in § 502 "sewage from vessels" covered by §312 and its MSD requirements from the definition of pollutant. If floating residences treat their sewage with Type I or II MSDs, then the VWCB may have an interest in regulating the discharge as a point source pollutant or bringing enforcement actions to force compliance with any requirements for holding tanks or dockside hookups.

   New Jersey also exempts vessel sewage from its discharge permit program (NJPDES) but uses two phrases to except liveaboards from this exemption: "incidental to the normal operation of a vessel" and "other than operating as a means of transportation." Thus, sewage disposal can be regulated on a boat that is not operating normally or is not being used for transportation. Moored houseboats without sewage connections are referred for enforcement and investigated.

*Recommendations for Actions at the Local Level*

Although the 1987 revisions to the Clean Water Act authorize the state to assume regulation and enforcement of MSD requirements for houseboats, the VDH may want to consider an approach that minimizes the state's role and maximizes the role of localities. Encouraging localities to regulate floating residences within state guidelines if they perceive houseboat discharges to be potential or actual problems would require less start-up time than getting an entire program passed by the General Assembly. It would also offer the advantage of letting localities with a greater interest in controlling the problem be models for any future legislation that the state would want to consider.

1. **The VDH should develop a model ordinance for regulation of sewage disposal from floating residences and encourage targeted areas at risk for pollution from floating residences to adopt the provisions of the ordinance.**

   *Comment:* The VDH may want to delegate primary responsibility for control of houseboat pollution to localities, as they already oversee such related land-use issues as housing density and building code inspections. This approach would be more "educatory" than regulatory but could be very effective and cost efficient if state support and advice were targeted toward the local officials of areas at risk. Washington's model ordinance could be helpful in this effort (see Washington State Department of Social and Health Services 1989b), since it distinguishes between liveaboard vessels that cruise and those that are not designed for operating in open waters. Graywater is not regulated in Washington's model provisions, but sewage from cruising vessels must go to holding tanks and noncruising vessels must be connected to approved shoreside sewers. Washington's model ordinance was patterned after ordinances in Berkeley and Marin County, California, and Dade County, Florida.

2. **The state should authorize local governments to tax floating residences as structures and not as vessels. Fifty percent of the revenue should go into a trust fund to provide dockside water, sewer, and electrical utilities.**

   *Comment:* In the Water Center's survey of other states' regulations for houseboats, avoidance of property taxes was cited as one reason for living on houseboats in Washington, DC. Some Maryland localities concerned about the use of floating residences eroding the local tax base have supported the development of state regulations and prohibitions. A real estate tax system for houseboats could act as a disincentive and result in fewer people choosing to live on them.

3. **The state should encourage localities with high concentrations of floating residences to regulate their use or density with authorities available to local jurisdictions.**

   *Comment:* Pulaski County, for instance, has a new zoning ordinance for the Claytor Lake area that requires a special use permit to moor or dock a houseboat; obtaining the permit requires notice to adjacent property owners, a public hearing, and planning commission approval. Although there are only a few areas in the state that have been granted authority by the General Assembly to use conditional zoning, Prince William County has the authority and uses the process to prohibit liveaboards at new marinas. When a developer applies for rezoning, the health department lobbies the planning department and a condition is imposed prohibiting liveaboard boats. A New Jersey municipality passed an ordinance that distinguishes between houseboats (vessels not designed primarily for dwelling) and floating homes (vessels used as permanent dwelling units) and prohibited the latter. The ordinance was upheld by a federal court of appeals [see *Bass River Associates v. Bass River Township*, 743 F.2d 159 (3rd Cir. 1984)], and the court took note of another local ordinance requiring a minimum of 3.2 acres per homesite. Creative use of zoning controls in areas with potential or actual problems has the advantage of provoking local concerns if there are local consequences from noncompliance by owners of floating residences.

*Enforcement Issues*

1. **State boating groups and marina owners should be involved in the process of developing regulations and statutes concerning houseboat sewage.**

   *Comments*: It is clear from the recent history of MSD regulations that boaters do not willingly comply with regulations regarding boat sewage. One article in a boaters' trade magazine (Weinschenk 1987) noted that federal MSD requirements were based on good intentions but have not worked and have made bad sanitation socially acceptable. If it is true that unpopular laws "make criminals out of law abiding citizens," then regulatory efforts need to include public participation efforts to learn the views of the regulated public. Since the state and federal governments do not have sufficient funds to use enforcement as the sole means of encouraging compliance, stimulating voluntary compliance should be a priority. One way to do this is to carry on a dialogue with the people most affected by the regulations. These people should be educated in the need for regulation and should be given the opportunity to provide input that will be used in the development of statutes and regulations.

2. **A Memorandum of Understanding should be developed between Virginia and the U.S. Coast Guard so that the state can share with the federal government the enforcement of § 311 and 312 of the federal Clean Water Act (CWA).**

*Comment:* With shrinking Coast Guard budgets and limited enforcement funding, the success of shared responsibility for enforcement of federal MSD requirements on all boats with toilets and enforcement of state controls on discharges from floating residences would depend on careful selection of areas targeted for enforcement. In a special *Issues and Actions* paper on boat pumpout facilities, the Chesapeake Bay Commission (1989) notes that selective enforcement could play an important role in helping boaters to realize that "it is less expensive to install an MSD than to get caught without one, if the chance of getting caught is reasonably high." Since the state has not opted in the past to share enforcement responsibilities with the Coast Guard, implementation of this recommendation would require a financial commitment by the General Assembly to enforce rules addressing water quality degradation by all boats with toilets, including floating residences.

3. **The state should require that seals be placed over wastewater discharge outlets on all movable and nonmovable floating residences docked or tied up at a marina or anchored within a mile of a marina. A sticker should be placed on the hull of vessels showing that the vessel has been inspected for a seal within the last year.**

4. **The state should authorize marinas to install seals for an established fee to be paid by the vessel owner.**

5. **The state should require that movable floating residences be inspected by marinas for seals on wastewater discharge outlets before docking at a marina overnight. Failure to make such an inspection by the marina would constitute a misdemeanor.**

6. **The state's regulations should provide that if the seal on any wastewater discharge outlet is broken, there is a rebuttable presumption that an illegal discharge has been made and the vessel owner is guilty of a misdemeanor.**

7. **The state should make it a misdemeanor for marinas to launch, service, or sell either movable or nonmovable floating residences not equipped with seals on wastewater discharge outlets.**

*Comment:* The five recommendations above are based on the idea that requiring seals on discharge outlets is the best way to discourage illegal discharges and to minimize patrolling of sensitive areas. Some states have used conservation wardens to inspect boats at marinas; others suggest that local police or marine patrol officers be involved in inspection and enforcement. Such enforcement efforts are expensive, however, and it may be that the incentives provided by marina fee collection would encourage the marinas to advocate for compliance and would provide a source of revenue to support facility construction. Another possibility for enforcement is to have boating organizations develop methods for inspection and for collection. "Ownership" of the enforcement system by the regulated community could enhance compliance and encourage participation in the inspection program.

*Future Research and Study*

This report serves to identify some of the gaps in available information about houseboat use in Virginia, the potential for overboard sewage disposal in the state, and degradation of water quality attributable to such sewage disposal. The following recommendations, however, point to the need for future study.

1. **The state should support the identification of areas particularly sensitive to discharges from MSDs as part of Virginia's next biennial water quality inventory.**

*Comment:* This recommendation follows one made by the Chesapeake Bay Commission (1989) in an *Issues and Actions* paper on boat pumpout facilities. Resources for pollution abatement need to go to activities that pose the greatest threat to water quality degradation and to areas where the potential for harm is large. Each of the Bay states is already committed to an inventory of water quality every two years by §305(b) of the Water Quality Act. With added resources, the VWCB could make the biennial assessment the primary vehicle for targeting areas at risk from MSD discharges and provide the state with a way to efficiently identify localities that need special support, for instance, in implementing a model ordinance to control houseboat sewage discharge or constructing additional facilities.

2. **The VDH should conduct a new survey on houseboat occupancy that will describe the duration of occupancy aboard floating residences in the state and the potential for overboard discharge of vessel sewage.**

   *Comment:* The number of interviews completed in the 1989 VDH survey was small, and thus the data may not provide a representative picture of the state's population of houseboat users. The VDH could contract out the job of designing and conducting a statistically sound survey that would distinguish between movable and nonmovable floating residences, determine the average duration of extended occupancy on each type of boat, describe the disposal and treatment systems currently in use on both, and ascertain the potential for overboard discharges.

   Alternatively, the VDH could use substantially the same survey but conduct interviews during evening hours and on weekends for a better response rate. Suggestions for expanding the existing survey include questions on (1) what type of houseboats are in use, i.e., movable or nonmovable floating residences, (2) whether the houseboat has to be moved to pump out wastes, (3) whether boaters have access to direct sewage hookups or dockside holding tanks instead of pumpout facilities, (4) the tank capacity of the boats' MSDs, (5) whether graywater is pumped through the system or pumped overboard, and (6) the average number of consecutive nights per year that the boat is occupied. It would also be useful to list the options that current technology makes available for treatment and disposal of boat wastes and survey the respondents for their preferred solutions.

3. **The VDH should conduct a new survey of marinas that will provide information on the availability of sewage disposal and treatment facilities at or near marinas.**

   *Comment:* Such a survey should be designed to determine whether hook-up of floating residences to public sewer lines or onshore septic systems is a feasible alternative for disposal of sewage from floating residences. Further, the survey should identify areas where onshore sewage treatment capacity to handle waste from pumpout facilities is inadequate. The state could then consider providing funds to upgrade existing treatment facilities. Funding priority should be consistent with the state's interest in Chesapeake Bay waters.

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Table 1. Calculated indices of the potential abundance of houseboats in the 16 localities with VDH houseboat survey data.

| Locality | a. Marinas Surveyed / Total Marinas | b. Slips Surveyed / Total Slips in Locality | c. Boats Surveyed / Total Slips in Locality |
|---|---|---|---|
| Accomack | 1.6 | 8.5 | 0.3 |
| Alexandria | 50.0 | 13.3 | 5.0 |
| Bedford | 16.7 | 41.3 | 2.9 |
| Chesterfield | 100.0 | 100.0 | 1.1 |
| Fairfax | 71.4 | 88.0 | 25.4 |
| Gloucester | 37.5 | 100.0 | 43.6 |
| Hampton | 16.7 | 38.0 | 17.3 |
| Henrico | 33.3 | 67.0 | 4.1 |
| Lancaster | 13.7 | 44.8 | 22.8 |
| Mathews | 2.9 | 0.6 | 0.3 |
| Middlesex | 35.3 | 71.0 | 42.6 |
| Norfolk | 55.3 | 74.9 | 24.7 |
| Northumberland | 7.5 | 23.1 | 1.8 |
| Prince William | 7.1 | 11.1 | 0.1 |
| Suffolk | 25.0 | 20.8 | 13.0 |
| Virginia Beach | 42.1 | 40.6 | 23.7 |

a. Proportions of surveyed marinas to total marinas (per locality).
b. Proportions of surveyed slips to total slips (per locality).
c. Proportions of surveyed boats with shower, food preparation, and toilet facilities to total slips (per locality).

**Table 2. Indicators of houseboat use for six Virginia localities identified as potential "problem areas" in the state.**

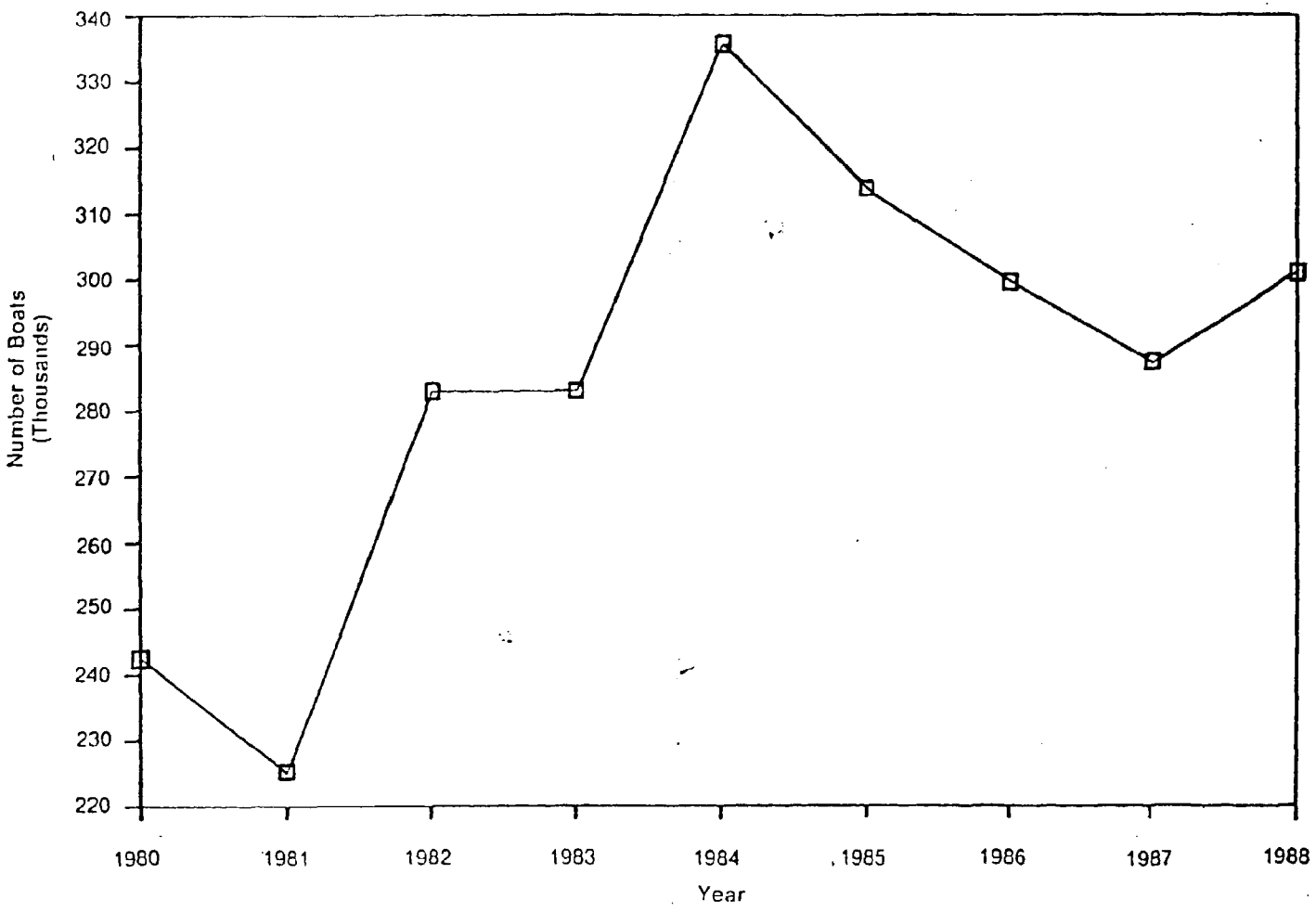
| Locality | # Boats Occupied ≥ 31 Days | # Boats with Berth, Galley, Toilet | # Boats Used as Primary Residence | # Boats with Water Connection | # Boats with Electric Connection | # Boats with Sewer Connection |
|---|---|---|---|---|---|---|
| Fairfax | 54 | 213 | 4 | --- | 204 | 0 |
| *Gloucester | 270 | 316 | 35 | 272 | 290 | 0 |
| *Lancaster | 4 | 199 | 0 | 0 | 78 | 0 |
| *Middlesex | 230 | 1,111 | 2 | 0 | 338 | 0 |
| *Norfolk | 55 | 819 | 67 | 252 | 280 | 5 |
| *Virginia Beach | 111 | 517 | 3 | 150 | 479 | 0 |

*Localities that have one or more marinas with no pumpout facilities.

# Numbers of Registered Motorboats

Size Class 26-40 Feet

(Total for All States*)




*including DC, American Samoa, Guam, N. Marianas, Puerto Rico, and Virgin Islands

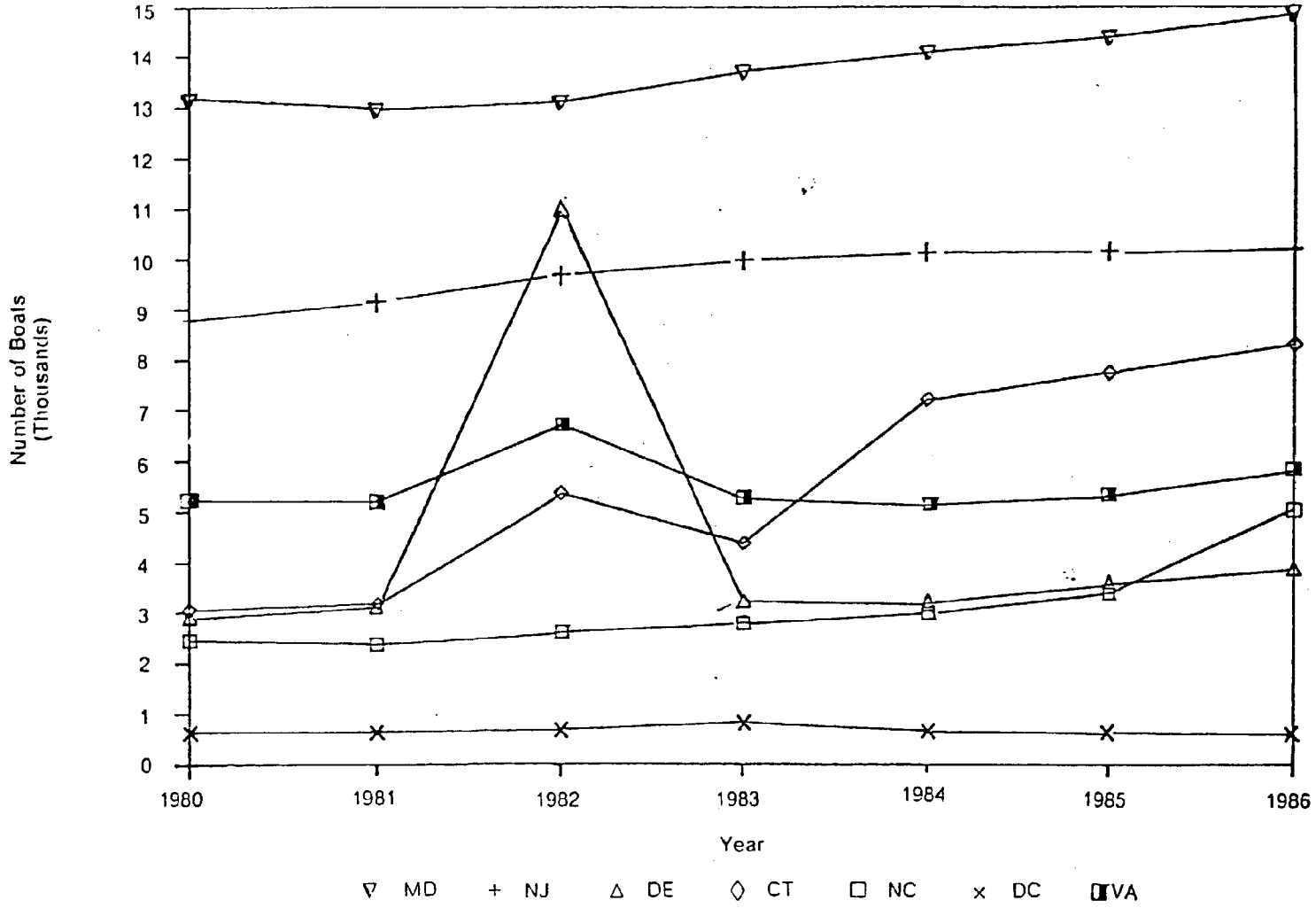
Source: Data From Office of Boating, Public, and Consumer Affairs. U.S. Coast Guard.

**Figure 1. Numbers of registered 26'-40' motorboats in the United States.**

# Numbers of Registered Motorboats

Size Class 26-40 Feet

(For Selected States)




Source: Data From Office of Boating, Public, and Consumer Affairs. U.S. Coast Guard.

**Figure 2. Numbers of registered 26'-40' motorboats in selected states.**

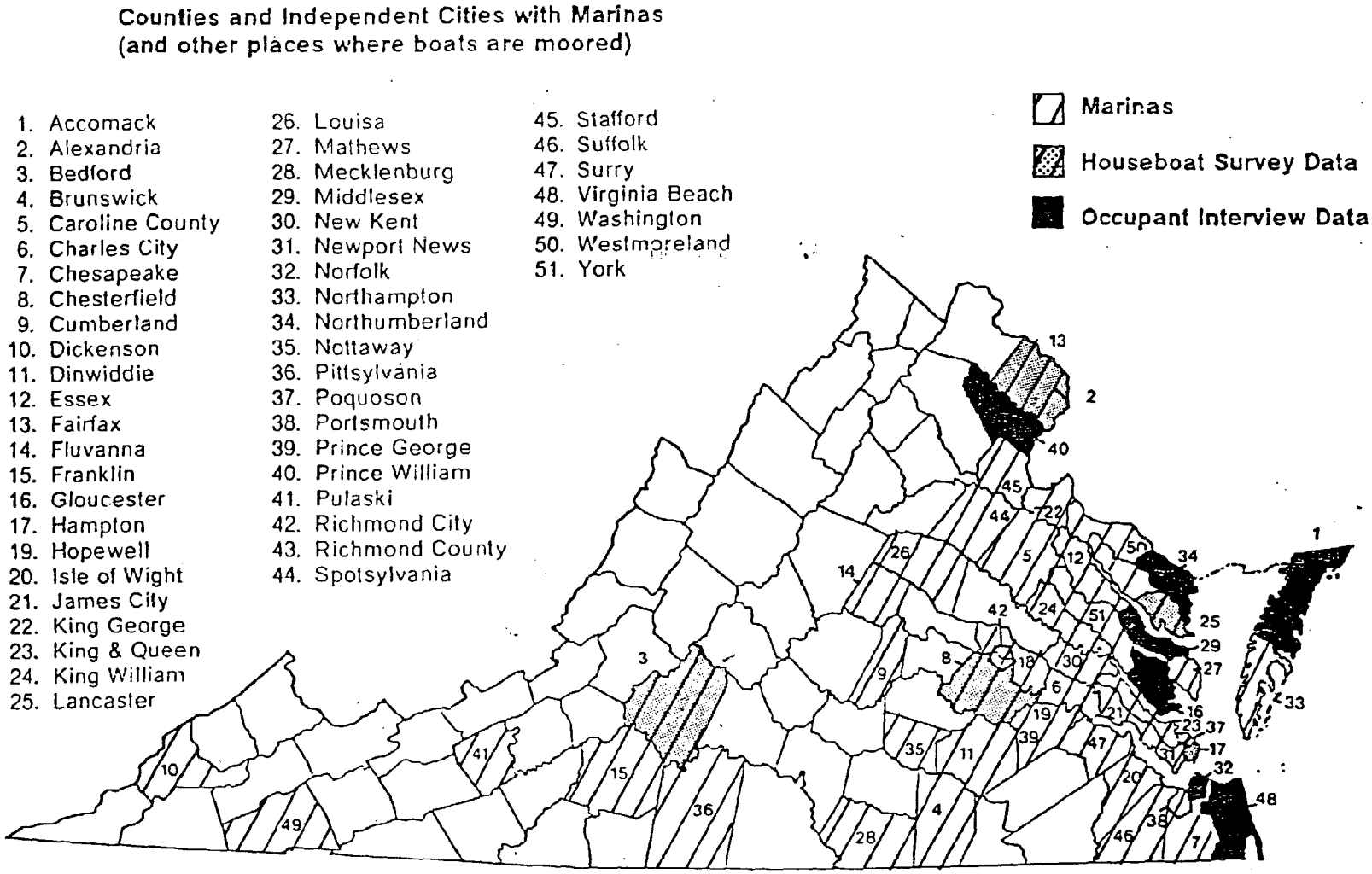



Figure 3. Distribution in Virginia of counties with marinas, counties with houseboat survey data, and counties with houseboat occupant interview data. "Marina" here refers both to marinas and to other places where boats are moored in the state. Counties for which houseboat survey data are available are stippled; counties with both houseboat survey data and houseboat occupancy data are blackened.